

Claims

1. Genetic marker at the 5'-flanking region of the α S1 casein gene (*CSN1S1*) characterized by the fact that it contains the nucleotide sequence 1 - 1061, preferably the nucleotide sequence 1 - 655 at the 5'-flanking region of the α S1 casein gene.
2. Genetic marker according to patent claim 1 characterized by its amplification by means of PCR reaction either through
Primer 1 CSN1S1pro1f (5' GAA TGA ATG AAC TAG TTA CC 3')
Primer 2 CSN1S1pro1r (5' GAA GAA GCA GCA AGC TGG 3')
or through
Primer 1 CSN1S1pro1f (5' GAA TGA ATG AAC TAG TTA CC 3')
Primer 3 CSN1S1pro2r (5' CCT TGA AAT ATT CTA CCA G 3')
3. Genetic marker according to patent claim 1 characterized by its variability within milk breeds.
4. Genetic marker according to patent claim 1 characterized by its utilization in order to determine the allelic state at the 5'-flanking region of the α S1 casein gene.
5. Procedure to determine the allelic state of the 5'-flanking region of the α s1 casein gene, characterized by the following steps:
 - a) provision of the source material of the organism to be examined
 - b) isolation of the genetic material
 - c) targeted isolation or enrichment of the marker fragment at the 5' region of the α s1 casein gene or of a sequence, which contains portions of the marker sequence, preferably the fragment 1 to 655 of the marker sequence out of the α s1 casein gene

- d) Proof of the allelic state in the isolated or enriched sequence fragment of the marker fragment of the $\alpha s1$ casein gene.
 - 6. Procedure according to patent claim 5 characterized by the utilization of source material coming from an animal, particularly a mammal, in particular a bovine, a sheep or a goat, including breed animals and embryos of these species.
 - 7. Procedure according to patent claim 5 characterized by the utilization of blood, leukocytes, tissue including biopsy material, milk, sperm, hair, individual cells including cell material from embryos, a bacteria culture or isolated chromosomes as source material.
 - 8. Procedure according to patent claim 5 characterized by the utilization of source material coming from a genetically modified organism (GMO) which contains the marker fragment of the $\alpha s1$ casein gene.
 - 9. Procedure according to patent claim 5 characterized by the utilization of genetic material containing genomic DNA or RNA from animals, plasmid DNA from bacteria, from artificial chromosomes such as BACs and YACs.
 - 10. Procedure according to patent claim 5 characterized by achieving the enrichment of the marker segment of the $\alpha s1$ casein gene by means of polymerase chain-reaction.
 - 11. Procedure according to patent claim 5 characterized by the enrichment of the marker segment of the $\alpha s1$ casein gene by means of polymerase chain-reaction with the oligonucleotides
- Primer 1 CSN1S1pro1f (5' GAA TGA ATG AAC TAG TTA CC 3')
- Primer 2 CSN1S1pro1r (5' GAA GAA GCA GCA AGC TGG 3')
- Primer 3 CSN1S1pro2r (5' CCT TGA AAT ATT CTA CCA G 3')

as primers, whereby the following combinations are selected: primer 1 with primer 2 and primer 2 with primer 3.

12. Procedure according to patent claim 5 characterized by the determination the allelic state by means of SSCP, RFLP, OLA, TGGE, ASPCR, PCR-ELISA, microarray method or through nucleic acid sequencing.
13. Procedure according to patent claim 5 characterized by detection of one or more of the allelic states of the marker sequence of the α s1 casein gene.
14. Utilization of the procedure according to the previous patent claims in order to examine the animals' milk production traits, independently of age and lactation.
15. Utilization of the procedure according to the previous patent claims in order to select organisms which carry a certain allelic state or a certain genotype of the marker sequence of the α s1 casein gene or a portion thereof.
16. Utilization of the procedure according to the previous patent claims in breeding programs, particularly for a marker-supported selection.
17. Utilization of the procedure according to the previous patent claims for the selection of increased milk protein yields.
18. Utilization of a marker according to patent claim 1 for genome analysis, in particular to carry out a genetic mapping and / or a linkage analysis.
19. Utilization of a marker according to patent claim 1 to create expression vectors.
20. Utilization of a marker according to patent claim 1 to produce transgenic animals.
21. Testkit, containing oligonucleotides to enrich a segment of the marker sequence of the α s1 casein gene, preferably

the primer 1 CSN1S1pro1f (5' GAA TGA ATG AAC TAG TTA CC 3'), primer 2 CSN1S1pro1r (5' GAA GAA GCA GCA AGC TGG 3') and primer 3 CSN1S1pro2r (5' CCT TGA AAT ATT CTA CCA G 3') as well as reference probes for one or various sequences of the marker sequence of the α s1 casein gene and the alleles thereof.